

Center for Biomedical Imaging

Annual Report FY2018

(issued September 2018)

The Center for Biomedical Imaging provides the resources to enable basic and clinical scientists to collaborate to discover new insights into normal and disease processes and to apply this knowledge to clinically relevant research.



Introduction & Background

The Center for Biomedical Imaging (CBI) was established by the Board of Trustees in 2010 as a *University Designated Center* under the direction of the Provost for Research. This decision has enabled MUSC to remain competitive with other academic institutions and to establish the infrastructure and environment to support this crucial research area.

The CBI central offices are located on the 2nd floor of the Bioengineering Building (BEB) at 68 President Street. The CBI is a resource for basic and clinical scientists collaborating to discover new information about normal and disease processes and how to apply this knowledge to clinically relevant research. Central to the mission objectives of the CBI are 1) service to the MUSC imaging research community, 2) training and mentorship of graduate students and future leaders in biomedical imaging, 3) recruitment of outstanding senior and young investigators, 4) discovery of new clinical applications of imaging and their practice in the clinical arena and 5) promotion of basic research in medical imaging and related fields. The CBI's website can be found [here](#).

In fiscal year 2018, the CBI provided imaging support and resources for a total of 66 grants, 47 of which were federal grants to MUSC. These grants represented approximately \$11.5M in funding to MUSC with approximately \$2.8M in indirect costs. The CBI also supports MUSC faculty by providing development time to be used for collaborations and the collection of pilot data. In FY2018, the CBI underwrote approximately \$226K of this development time for MUSC researchers

Mission Statement:

The mission of the CBI is to provide the leadership and infrastructure in the imaging sciences necessary for basic and clinical scientists to collaborate, discover new ways to study normal and disease processes, develop and apply this knowledge to clinically relevant research, and to translate these advances to the patient community while providing a quality graduate education environment.

Vision Statement:

The vision of the CBI is to be recognized as an integrated and multidisciplinary center for biomedical imaging research with mutually supportive and valued interactions among basic science and clinical departments, to recruit outstanding faculty and educate the future leaders of the field.

Administration

General:

In FY2018, the leadership of the CBI included:

Dr. Joseph A. Helpern, Director
Dr. Truman R. Brown, Scientific Director
Dr. Jens Jensen, Associate Director

CBI Internal Advisory Committee:

The CBI's Internal Advisory Committee (IAC) comprises the CBI Directors as well as both early stage and senior researchers from across the University. Many of these individuals are experienced in participating in large research programs as well as in the management of shared facilities. The IAC advises the Director on the administrative operation of the CBI, coordinates resources, and ensures that the research conducted within the CBI is appropriately prioritized to reflect the overall goals of MUSC.

Members of the IAC in FY2018 were:

Dr. Kathleen Brady	Dr. Peter Kalivas (Chair)
Dr. Truman Brown	Dr. Steven Kautz
Dr. Chris Davis	Dr. Lisa McTeague
Dr. Joseph A. Helpern	Dr. Andy Shih
Dr. Jens Jensen	Dr. Thomas Uhde

CBI leadership continued to hold quarterly "Advisory Board Meetings" as well as "Town Hall Meetings" in which all users were able to express their views and opinions. These meetings were held on:

CBI Advisory Board

August 15, 2017
November 28, 2017
February 6, 2018
May 1, 2018

Town Hall

July 26, 2017
February 6, 2018
May 8, 2018

Scheduling:

Scheduling of time on imaging systems is performed through a web-based system called Calpendo (<https://musc.calpendo.com/>), that allows researchers with approved IRB or IACUC protocols to examine and schedule CBI equipment and facilities.

Operations

Faculty & Staff:

The following full and part-time faculty & staff were employed by CBI in FY2018:

Brown, Dr. Truman	(0.25 FTE)	Professor, Scientific Director
Coatsworth, James	(1.00 FTE)	3T MRI Program Manager
Doose, Jayce	(0.10 FTE)	Biomedical Engineer
Fleury, Thomas	(1.00 FTE)	Research Specialist
Helpern, Joseph A.	(0.25 FTE)	Professor, Director
Henderson, Scott	(1.00 FTE)	3T MRI Program Manager
Huggins, Terri	(0.20 FTE)	Grant Administrator
Jensen, Dr. Jens	(0.25 FTE)	Professor, Associate Director
Lewis, Dave	(0.50 FTE)	Senior Staff Scientist
McMichael, Alana	(0.20 FTE)	Program Coordinator
Miller, Ashly	(0.40 FTE)	Administrative Assistant
Nie, Xingju	(1.00 FTE)	7T MRI Research Specialist
Purl, James	(1.00 FTE)	3T MRI Program Manager
Roberts, Donna	(0.05 FTE)	Assistant Professor
Sessions, Jennifer	(0.20 FTE)	Program Manager II

Preclinical (Small Animal) Imaging:

Bruker 7T MRI: The BioSpec 70/30 MRI scanner is a multipurpose system for high-resolution MR spectroscopy and imaging operating at 7 Tesla (T). The 7T MRI is ideal for 2D and/or 3D high-resolution anatomical imaging as well as diffusion and diffusion tensor, flow, cardiac, dynamic contrast, functional MRI and chemical shift imaging. The operating system of the Bruker 7T MRI is now out of service support and will need to be upgraded soon.

Human imaging Resources:

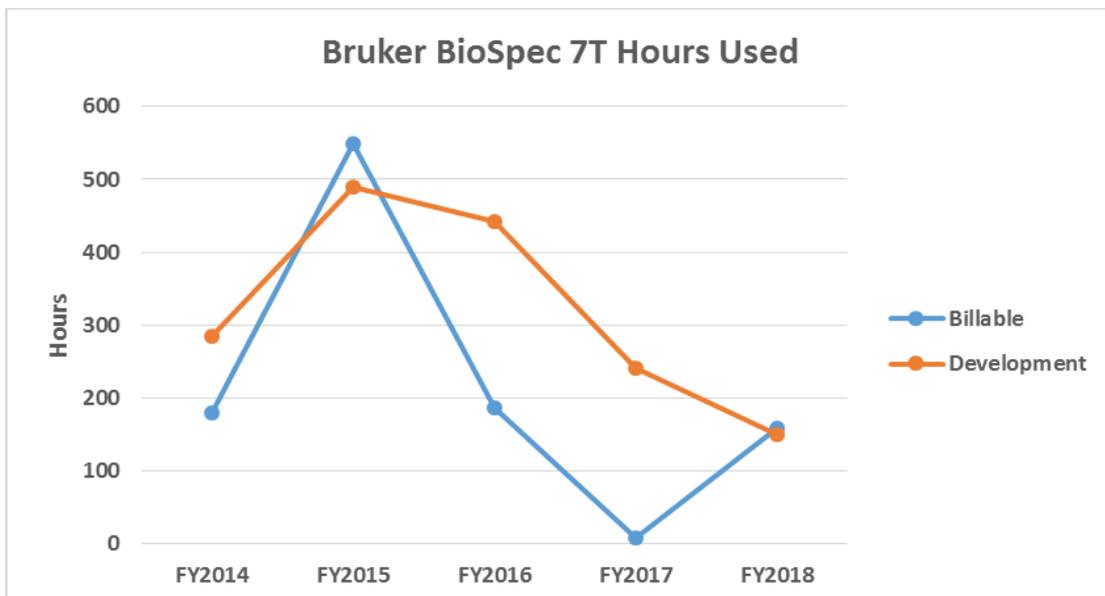
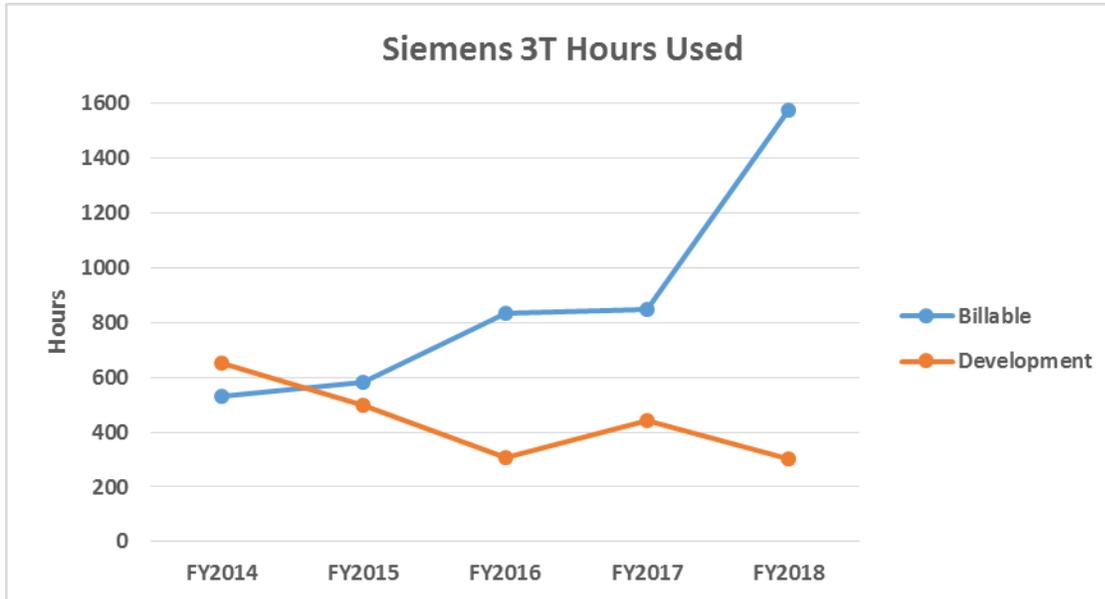
Siemens 3T Prisma MRI Scanner: In FY2017, the CBI upgraded the Siemens MAGNETOM Trio 3T MRI system to a Siemens MAGNETOM Prisma 3T MRI system. Since then, this upgrade has significantly impacted a multitude of National Institutes of Health (NIH) funded researchers (as well as researchers funded from other sources) in the fields of substance abuse, addiction, aging, Alzheimer's disease (AD), Parkinson's disease (PD), Attention-Deficit Hyperactivity Disorder (ADHD) and stroke in addition to basic science brain research. The current system is the only human MRI research scanner at MUSC and one of only two human research scanners in South Carolina.

Mock Scanner: The Mock Scanner is a full-size replica of the 3T MRI made from plywood and other building materials to look and sound like the real MRI. The Mock Scanner is available to be used for 'trial runs' with patients who are wary of undergoing the full scanning procedure and can be also booked for use as a training or demonstration tool.

Equipment Usage:

The CBI houses a state-of-the-art Siemens 3T MAGNETOM Prisma MRI scanner, which operates with a 100% mandate for research. The system is also covered by a Master Research Agreement with Siemens Medical. Preclinical imaging space is located in the Bioengineering Building which houses a Bruker 7T animal MRI system, a surgery room, as well as wet and dry labs, classrooms, and an auditorium.

Shown in the figures below is the hourly usage from FY2014 through FY2018 for the Siemens 3T MRI and Bruker BioSpec 7T MRI.



Faculty

The CBI is a large, multidisciplinary group of 27 faculty members and 12 staff representing various clinical and basic science departments at MUSC. Collaboration among faculty in the development of new and cross-disciplinary methodologies is strongly encouraged.

Faculty members contribute to teaching CBI courses and generally support the overall well-being of the CBI. They are expected to take part in regularly scheduled educational meetings, including the *Nuts and Bolts of Imaging* meetings, which provides a forum for researchers to have in-depth technical discussions. Each faculty member is asked to give a lecture on their research to the CBI community approximately every other year.

Adkins, DeAnna Ph.D.	Assistant Professor	Neuroscience
Benitez, Andreana Ph.D,	Assistant Professor	Neurology
Boniha, Leonardo M.D., Ph.D.	Assistant Professor	Neurology
Borckardt, Jeffrey Ph.D.	Associate Professor	Psychiatry
Broome, Ann-Marie MBA, Ph.D.	Assistant Professor	Cell & Molec. Pharmacology
Brown, Truman Ph.D.	Professor, Scientific Director	Radiology
Eckert, Mark Ph.D.	Associate Professor	Otolaryngology
Falangola, Maria M.D., Ph.D.	Assistant Professor	Neuroscience
Froeliger, Brett Ph.D.	Assistant Professor	Neuroscience
George, Mark M.D.	Distinguished University Professor	Psychiatry
Hanlon, Colleen Ph.D.	Assistant Professor	Psychiatry
Harris, Kelly Ph.D.	Associate Professor	Otolaryngology
Helpern, Joseph Ph.D.	Professor, Director	Radiology
Jensen, Jens Ph.D.	Professor, Associate Director	Radiology
Joseph, Jane Ph.D.	Professor	Neuroscience
LaRue, Amanda Ph.D	Professor	Pathology & Lab. Medicine
Li, Xingbao M.D.	Assistant Professor	Psychiatry
McTeague, Lisa Ph.D.	Assistant Professor	Psychiatry
Naselaris, Thomas Ph.D.	Professor	Neuroscience
Prisciandaro, James Ph.D.	Assistant Professor	Psychiatry
Roberts, Donna M.D.	Assistant Professor	Psychiatry
Schacht, Joseph Ph.D.	Assistant Professor	Psychiatry
Shih, Andy Ph.D.	Associate Professor	Neuroscience
Spampinato, Vittoria M.D.	Associate Professor	Radiology
Squeglia, Lindsay Ph.D.	Associate Professor	Psychiatry
Tipnis, Sameer Ph.D.	Assistant Professor	Radiology
Yu, Xue-Zhong M.D., M.S.	Professor	Microbiology

Education

Biomedical Imaging Ph.D. Program

Due to budget constraints at the University level, the Biomedical Imaging PhD Program has suspended the enrollment of new students until further notice.

User Group Meeting (Nuts & Bolts)

The CBI Nuts and Bolts User Group meets twice a month and provides a forum for in-depth discussions by researchers about imaging, statistical methods, data analysis techniques and administrative issues. The first portion of the meeting is dedicated to discussion of CBI equipment and administrative issues, and the remainder of the meeting typically consists of a presentation of a discussion topic chosen by the group.

Lectures

The CBI regularly hosts lectures given by both visiting speakers and CBI faculty. Past lectures have included the following:

Date	Presenter	Title	University
6/13/2018	Emilie McKinnon, Biomedical Imaging Graduate Student	Fiber Ball Imaging: Analysis	MUSC
6/6/2018	Siemens Representatives	How to Optimize Acquisition on the Siemens 3T Prisma	Siemens
5/23/2018	Vitria Adisetiyo, PhD., Emilie McKinnon, Hunter Moss, Golbarg Tarighat Saber, PhD. and Jens Jensen, PhD.	Flash Talks from the MUSC Presenters at International Society for Magnetic Resonance in Medicine (ISMRM)	MUSC
5/9/2018	James J. Prisciandaro, PhD	In Vivo Measurement of Neurometabolites using Proton Magnetic Resonance Spectroscopy	MUSC
4/25/2018	Jens Jensen, PhD.	Fiber Ball Imaging	MUSC
4/11/2018	Rano Chatterjee, M.D.	High Resolution MR Intracranial Vessel Wall Imaging: Challenges in Developing, Validating, and Finding Clinical Application for a Novel Imaging Biomarker	MUSC
3/28/2018	Tom Fleury	New 3T Data Flow: How to Access Your Data	MUSC
10/19/2017	Karen Seymour, PhD	Emotion Dysregulation in Children with Attention Deficit/Hyperactivity Disorder (ADHD)	Johns Hopkins University

Appendix I: Budget

FY 2018 Actual

Budget Category	Admin	3T	7T	Totals	% of Category Total
	44750	49751	49752		
Revenue					
Scan Revenue	\$0	\$924,000	\$22,900	\$946,900	100.00%
Institutional Support	\$0.00	\$0.00	\$0.00	\$0	0.00%
Revenue Total	\$0	\$924,000	\$22,900	\$946,900	100.00%
Expenses					
Payroll					
Total Payroll (salary + fringe)	\$78,694	\$455,042	\$94,255	\$627,991	100.00%
Direct Costs					
Service Contracts*		\$34,053	\$37,500	\$71,553	36.43%
Equipment		\$59,337	\$32,000	\$91,337	46.51%
Study Participant Fees		\$90		\$90	0.05%
Shipping & Postage		\$490		\$490	0.25%
Xerox Service and Maintenance Agreement	\$850			\$850	0.43%
Calpendo License		\$5,826		\$5,826	2.97%
Additional Software Licenses		\$79		\$79	0.04%
Additional Storage Fees for PRISMA				\$0	0.00%
Office Supplies	\$2,304	\$7,216		\$9,520	4.85%
Med/Sci/Lab Supplies		\$6,340	\$4,578	\$10,918	5.56%
Animal Per Diem			\$120	\$120	0.06%
Travel		\$464		\$464	0.24%
Internal Service Charges		\$5,063	\$84	\$5,147	2.62%
Total Direct Costs	\$3,154	\$118,958	\$74,282	\$196,394	100.00%
Indirect Costs					
30 Bee Street Lease		\$29,354		\$29,354	41.40%
30 Bee Street Security System		\$640		\$640	0.90%
Utilities		\$12,198		\$12,198	17.21%
Commercial Insurance		\$216		\$216	0.30%
General Repairs	\$221	\$1,055		\$1,276	1.80%
Environmental Sanitation (Steritech)		\$317		\$317	0.45%
Telephone (Centrex)	\$1,652	\$877	\$136	\$2,665	3.76%
Building Maintenance (CBI/CAIR)		\$18,659		\$18,659	26.32%
Hazard & Flood Insurance		\$5,572		\$5,572	7.86%
Total Indirect Costs	\$1,873	\$68,888	\$136	\$70,897	100.00%
Total Expenses	\$83,721	\$642,888	\$168,673	\$895,282	
% of Total Expenses	9.4%	71.8%	18.8%	100.0%	
Total Revenue less Total Expenses	(\$83,721)	\$281,112	(\$145,773)	\$51,618	

Appendix II: Grants Supported by CBI

User	Grant Title	Funding Agency
Adams, Zachary	ORWH: SCOR on Sex and Gender Factors Affecting Women's Health	NIDA
Adisetiyo, Vitria	Differential and Predictive Brain Biomarkers of ADHD with High Risk Substance Use Disorders	Klingenstein Third Generation Foundation
Anton, Raymond	Gabapentin for Relapse Prevention: Alc. Withdrawal-Brain Gaba/Glutamate Effects	NIAAA
Anton, Raymond	Effect of GET73 on MRS Measures of Central Glutamate and GABA in Individuals With Alcohol Use Disorder	Laboratorio Farmaceutico CT
Atz, Andrew	Single Ventricle Reconstruction III: Brain Connectome and Neurodevelopmental Outcomes	NHLBI
Back, Sudie	Glial Regulators for Treating Comorbid Posttraumatic Stress Disorder and Substance Use Disorders	DOD
Back, Sudie	Clinical Trial for Alcohol Use Disorder and Post Traumatic Stress Disorder (PTSD)	NIAAA
Back, Sudie	CAP - Doxazosin in the Treatment of Co-Occurring PTSD and Alcohol Use Disorders	VA
Benitez, Anya	White Matter Tract Integrity Biomarkers of Neurodegeneration in Aging and MCI	NIA
Benitez, Anya	Imaging Resilience in a Rare Brain Disease	Rare Disease Foundation
Bonilha, Leo	Center for the Study of Aphasia Recovery: (C-STAR)	NIDCD
Bonilha, Leo	Wide Spectrum Investigation of Stroke Outcome Disparities on Multiple Levels (WISSDOM)	AHA
Borckardt, Jeffery	RCT of TDCS-Augmented CBT for Veterans with Pain and Opioid Misuse	NIDA
Bowden, Mark	SC Research Center for Recovery from Stroke: Project 2 - Excitatory and Inhibitory RTMS as Mechanistic Contributors to Walking Recovery	NIGMS
Brady, Kathleen	ORWH: SCOR on Sex and Gender Factors Affecting Women's Health	NIDA
Brown, Truman	EEG/fMRI Controlled TMS Real-Time Neural Feedback in Anti-Depressive Treatment	NIMH
Clark, David	221AD301 Phase 3 Study of Aducanumab (BIIB037) in Early Alzheimer's Disease (ENGAGE)	Biogen
Cooper, Christine	Brain Circuitry Changes in Vascular Parkinsonism	SCTR and MUSC Foundation's Charles and Dianne Barmore Fund for Parkinson's research

Cortese, Bernadette	Trauma-Related Olfactory Cues in Posttraumatic Stress Disorder	NIMH
Dale-Livingston, Marian	Study of BIIB092 in Participants With Progressive Supranuclear Palsy (PASSPORT)	Biogen
Danielson, Carla	Threat-Related Negative Valence Systems, Child Victimization, and Anxiety	NIMH
Eckert, Mark	Neuroimaging of Age-Related Changes in Speech Recognition	NIDCD
Feng, Wayne	SC Research Center for Recovery from Stroke: Project 3 - Optimizing Transcranial Direct Current Stimulation Current and Electrode Montage for Stroke Patients	NIGMS
Froeliger, Brett	Translational Neuropsychopharmacology Research of Nicotine Addiction	NIDA
George, Mark	A Randomized, sham-controlled trial of the safety and effectiveness of Neurostar Transcranial Magnetic Stimulation (TMS) Therapy in depressed adolescents.	Neuronetics
George, Mark	Focal Electrically-Administered Seizure Therapy (FEAST)	Other
Grattan, Emily	Examining the effects of transcranial direct current stimulation and task-specific practice on cortical modulation among individuals with unilateral spatial neglect post stroke	NICHHD
Gregory, Chris	Treating Depression and Enhancing Locomotor Recovery Post-Stroke	NIGMS
Gregory, Chris	Contract for Neuro-Rehabilitation Engineering Services: Skeletal Muscle Plasticity as an Indicator of Functional Performance Post Stroke	VA
Gregory, Chris	To Evaluate the Neuromuscular Consequences That Occur Following Anterior Cruciate Ligament (ACL) Reconstruction.	Other
Hanlon, Coleen	Developing brain stimulation as a treatment for pain in opiate dependent individuals: Parametric assessment of 2 evidence-based strategies	SCTR
Hanlon, Colleen	Charleston ARC Clinical Project 4- Cortical rTMS as a tool to change craving and brain reactivity to alcohol cues	NIAAA
Hanlon, Colleen	10 Days of MPFC Theta Burst to Improve Clinical Outcomes in Treatment-engaged cocaine users	NIDA
Hanlon, Colleen	Longitudinal Study of Functional Connectivity Among Cocaine Users in Treatment	NIDA
Hanlon, Colleen	SC Research Center for Recovery from Stroke: Project 1 - Investigating the Neurobiologic Basis for Loss of Cortical Laterality in Chronic Stroke Patients	NIGMS
Harris, Kelly	Neural Determinants of Sound Encoding in the Aging Ear and Brain	NIDCD

Helpern, Joseph	Quantitative Neuroimaging Assessment of White Matter Integrity in the Context of Aging and AD	NIA
Hinson, Vanessa	Evaluating the Safety, Pharmacokinetics, and Pharmacodynamics of BIIB054 in Participants With Parkinson's Disease (SPARK)	Biogen
Holmstedt, Christine	Navigate Embolic Stroke of Unknown Source	Bayer Health Care
Jensen, Jens/Falangola, Maria de Fatima	Assessing Brain Microstructure in Alzheimer's Disease with Advanced Diffusion MRI	NIA
Kautz, Steven	The effects of impaired post-stroke coordination and motor pathway integrity on mobility performance	VA
Luttrell, Louis	Epidemiology of Diabetes Interventions and Complications Study (EDIC)	NIDDK
McRae-Clark, Aimee	Neural Substrates of Emotion: Impact of Childhood Trauma and cocaine dependency	NIDA
McRae-Clark, Aimee	Advancing Varenicline as a Treatment for Cannabis Use Disorder	NIDA
McTeague, Lisa	Remediating Emotion Deficits in PTSD: Probing and Modulating Neurocircuits	NIMH
Mcteague, Lisa	Extinguishing Fear and Craving: Neuromodulating Shared Circuits	SCTR
Mellick, Will	Preliminary Validation of a Novel Natural Rewards fMRI Paradigm: Comparing Relative Brain Activation to Natural Rewards versus Alcohol Cues in Individuals with Alcohol Use Disorder and Social Drinkers	NIAAA
Mintzer, Jacobo	Alzheimer's Disease Neuroimaging Initiative 3 (ADNI 3)	NIA
Mintzer, Jacobo	Longitudinal Evaluation of Amyloid Risk and Neurodegeneration - the LEARN Study. A Companion Observational Study to Anti-Amyloid Treatment in Asymptomatic Alzheimer's Disease (A4) Trial	NIA
Mintzer, Jacobo	Long-Term Nicotine Treatment of Mild Cognitive Impairment	NIA
Mintzer, Jacobo	Effects of Traumatic Brain Injury and Post-Traumatic Stress Disorder and Alzheimer's Disease on Brain Tau in Vietnam Veterans using ADNI	DOD

Mintzer, Jacobo	A Double Blind, Randomized, Placebo Controlled, Parallel Group Study to Simultaneously Qualify a Biomarker Algorithm for Prognosis of Risk of Developing MCI Due to Alzheimer's Disease and to Test the Safety and Efficacy of Pioglitazone	Takeda
Prisciandaro, James	Neuroimaging Mechanisms of Overlap between Alcoholism and Bipolar Disorder	NIAAA
Prisciandaro, James	Imaging Framework for Testing GABAergic/glutamatergic Drugs in Bipolar Alcoholics	NIAAA
Prisciandaro, James	Gabapentin for Bipolar & Cannabis Use Disorders	NIDA
Revuelta, Gonzalo	Identification of Gait and Imaging Markers for Freezing of Gait in Parkinson's Disease	NINDS
Revuelta, Gonzalo	Effects of Neuromodulation and Rehabilitation of the Locomotor Network in Freezing of Gait (TMS/FOG)	Other
Sahlem, Greg	A Preliminary Investigation of Pre-Frontal repetitive Transcranial Magnetic Stimulation (rTMS) for the Treatment of Cannabis Use Disorder.	Other
Schacht, Joe	Neural Connectivity and the Transition to Alcohol Dependence	NIAAA
Schacht, Joe	Effects of Cortical Dopamine Regulation on Drinking, Craving, and Cognitive Control	NIAAA
Seo, Na Jin	Brain functional connectivity & sensory stimulation-enhanced therapy post stroke	NIGMS
Squeglia, Lindsay	The Adolescent Brain Cognitive Development (ABCD) Study	NIDA
Squeglia, Lindsay	Neural Correlates of Behavioral Treatment Targets in Teens with Substance Use Problems and Post-Traumatic Stress	Chairman's Research Development Fund
Squeglia, Lindsay	Neuroscience-Informed Treatment Development for Adolescent Alcohol Use	NIAAA
Teubner-Rhodes, Susan	Understanding cognitive and neurobiological factors of age-related speech recognition declines	NIDCD
Turan, Tanya	Characterization of Intracranial Atherosclerotic Stenosis Using High Resolution MRI	NINDS
Turan, Tanya	Carotid Revascularization and Medical Management for Asymptomatic Carotid Stenosis Trial (CREST-2) Trial	Mayo Clinic



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